REMARKS

Page 10 of the specification has been amended to rewrite the heading "Light irradiation" as "Irradiation with light", to remove any ambiguity associated with the word "light". Support for the amendment may be found on the line immediately following that heading, which recites "irradiation with light."

Claim 1, directed to a method for producing a xanthophyll from a photosynthetic microalga, has been amended to claim the preferred embodiment disclosed in the specification and originally claimed in claim 2, wherein encysted microalga cells are inoculated and grown, and then the obtained microalga is again encysted. As a result of this process, microalga cells are obtained which have a higher xanthophyll content than microalga cells obtained by growing non-encysted cells. This xanthophyll-rich microalga cell is claimed in new claim 13.

Claim 2 has been canceled, and the dependency of claims 3, 4, 5, 6, 8, 9, 10 and 11 has been revised to reflect the cancelation of claim 2.

Claim 4 has been amended to define the low nutrient medium as one in which the concentration of nitrogen source is "at least 0.02 g/L and less than 0.15 g/L expressed in terms of nitrogen", as disclosed on page 8, lines 16-17, of the specification.

Claim 6 has been amended to clarify that the nutrient medium for the growth step and the nutrient medium for the encystment step are different from each other.

Claim 8 has been amended to recite "irradiation with light" instead of "light irradiation". A similar amendment was also made to page 10 of the specification, as described above.

Claim 12 has been canceled and replaced with new claim 13 which is directed to a xanthophyll-rich photosynthetic microalga cell, as shown in Fig. 2 of the application, which has a higher xanthophyll content than a microalgal cell obtained by culture of a non-encysted microalga cell.

In summary, claims 1, 2-11, and 13 are pending in the application and are under consideration. No additional claim fee is required as a result of the claim amendments.

Personal Interview

The Examiner is thanked for the courtesy of the personal interview held on August 12, 2008, and recorded in the Interview Summary of the same date. Applicants' attorney had indicated that Applicants intended to:

- Amend claim 1 by incorporating the limitations of claim 2 into claim 1;
- Amend claim 4 by reciting the nitrogen content disclosed on page 8, lines 16-17, of the specification for a low nutrient medium;
- Amend claim 6 to recite that the nutrient medium for the growth step and the nutrient medium for the encystment step are different from each other;
- Amend claim 8 to recite "irradiation with light" instead of "light irradiation";
- Amend claim 12 to claim an "isolated photosynthetic microalga having a zoospore containing a xanthophyll."
- Distinguish the cited Hata et al. reference by pointing out that the reference does not teach or suggest that encysted microalga be used as the starting material which is inoculated and grown, and then the obtained microalga is again encysted. Claim 1 as amended is limited to a process which uses such encysted microalga as a starting material.

The claim amendments presented in this response are based on the amendments presented at the interview, with further revisions taking into consideration the discussion at the interview.

Objection to Specification

In response to the request that the specification be checked and any minor errors found therein be corrected, the heading "Light irradiation" on page 10 has been corrected to "Irradiation with light" to remove any ambiguity associated with the word "Light" in the original heading.

Objection to Claim 2

As stated on page 2 of the Office Action, claim 2 was objected to under 37 C.F.R. 1.75(c) for failing to further limit the subject matter of claim 1 on which claim 2 depends. As explained by Applicant's attorney at the personal interview held on August 12, 2008, claim 2 indeed does narrow the subject matter of claim 1, by limiting the microalga being inoculated to microalga of an encysted nature. This more narrow embodiment of the claimed process for producing a xanthophyll is now recited in claim 1 as amended, and claim 2 has been canceled accordingly.

Rejection under 35 U.S.C. § 112

Page 2 of the Office Action sets forth a rejection of claims 4, 6 and 7 under 35 U.S.C. § 112, second paragraph, on the ground that the certain phrases render the claim language indefinite.

- Claim 4, line 2: "a low nutrient medium";
- Claim 6: "different media";
- Claim 7: "light irradiation" (Note: Applicant assumes that this rejection was intended for claim 8, as opposed to claim 7 which does not recite "light irradiation".)

In response to this ground of rejection:

1. Claim 4 has been amended to define the low nutrient medium as one in which the concentration of nitrogen source is "at least 0.02 g/L and less than 0.15 g/L expressed in terms of nitrogen", as disclosed on page 8, lines 16-17, of the specification.
2. Claim 6 has been amended to clarify that the nutrient medium for the growth step and the nutrient medium for the encystment step are different from each other.
3. Claim 8 has been amended to recite "irradiation with light" instead of "light irradiation". This amendment is parallel to a similar amendment made to page 10 of the specification, as described above.

Rejection under 35 U.S.C. § 102(b)

Original claims 1-12 were rejected under 35 U.S.C. § 102(b) as being anticipated by Hata et al. The reference is cited for teaching a method for the production of astaxanthin by sequential heterotrophic-photoautotrophic cultivation of a photosynthetic microalga, using a growth step in a nutrient medium and an encystment step for encysting the microalga. However, as was pointed out by Applicant's attorney at the interview with the Examiner, Hata et al. does not teach or suggest the process recited in amended claim 1, in which the starting material being cultivated is already an encysted photosynthetic microalga. After cultivation of that encysted microalga, the obtained microalga is further subjected to encystment. As a result, a microalga cell is obtained which has a higher concentration of astaxanthin, as claimed in new claim 13 which is directed to a xanthophyll-rich microalga cell.

Table 2 on page 20 of the specification shows that the method recited in claim 1, as amended, results in a much higher concentration of xanthophyll in the cell suspension as well as per dry alga body weight. Example 1 in Table 2 is representative of the claimed process in which encysted microalga is inoculated and grown, and then the obtained microalga is further encysted. Ref. Example 1 in Table 2 is a comparative example in which non-encysted cells were used as the starting material being inoculated and grown, and then the obtained microalga was encysted. The concentration of xanthophyll in the cell suspension obtained according to the claimed process is 80 mg/l, compared to 42 mg/l obtained in the comparative experiment. Similarly, the xanthophyll content per dry alga body weight is 1.8% by weight, compared to 0.9%.

Hata et al. discloses that vegetative (i.e., non-encysted) cells of the microalga are cultivated heterotrophically to a high cell concentration, followed by photoautotrophic cultivation under illumination. The formation of encysted cells was avoided in the heterotrophic phase by using repeated fed-batch processes which allowed the cells to be maintained in the vegetative form (Abstract, lines 9-10.) In the fed-batch heterotrophic cultivation the fermentor was wrapped in aluminum foil to avoid penetration by light (page 397, left column, second paragraph, lines 6-8.) It is understood that this precaution is for the purpose of avoiding the encystment of cells. Hata et al. also explains why encystment of the cells is to be avoided in the first phase of cultivation:

> "Although cyst cells can grow by increase in the size, their rate of cell division is very slow so that once the cells have encysted, it becomes very difficult to increase the cell number." (page 396, left column, last four lines of first paragraph)

In summary, Hata et al. does not teach, and even teaches away from, the use of an encysted microalga as the starting material in the production of a xanthophyll by cultivation of the microalga. It is respectfully submitted that the claimed method for producing a xanthophyll from a photosynthetic microalga, and the claimed xanthophyll-rich microalga cell obtained by the claimed process are not anticipated and not rendered obvious by Hata et al.

Double patenting

Claims 1-11 were provisionally rejected under the judicially created doctrine of double patenting over claims 5-14 of copending application number 11/270,116. (During the personal

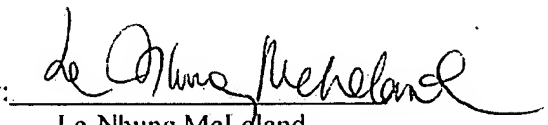
interview the Examiner provided the correct serial number for the copending application, which correct number is 11/720,116.) Since the copending application has not been examined yet, a terminal disclaimer will be filed in the copending application if such terminal disclaimer is found to be necessary during the prosecution of the copending application.

It is believed that the claims as amended in this response are patentable over the cited prior art. However, in the event the Examiner believes that there is any remaining issue and it may be resolved to place the application in condition for allowance, the Examiner is invited to contact Applicants' attorney at the telephone number listed below.

A petition for a two-month extension of the period for response to the Office Action and the requisite fee are submitted concurrently herewith. In the event a further extension of time is considered to be required, Applicants hereby petition for an appropriate further extension of the period for response to the Office Action. The fee for such petition may be charged to Deposit Account 502081.

Respectfully submitted,

McLELAND PATENT LAW OFFICE, P.L.L.C.

By: 

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Enclosure: Petition for extension of time